CHAPTER 3

ENVIRONMENTAL EFFECTS ON OPERATIONS

Weather information is critical to aviation planning. Aviation commanders and staffs must have current weather forecasts and observations throughout the entire area of operations (AO). Commanders must evaluate forecasted weather conditions for potential effects on plans, operations, and aviation assets. By exploiting adverse weather conditions, commanders and planners can take advantage of threat vulnerabilities and favorably influence their own courses of action.

3-1. EFFECTS OF WEATHER

Adverse weather can influence all Army aviation operations. Severe weather conditions may completely prohibit or drastically reduce aerial maneuver. However, some weather conditions benefit aviation operations. For example, fallen snow, extreme cold weather, or muddy terrain can limit or prohibit the movement of ground forces, while having little effect on aviation operations. Low cloud cover and ceilings may enhance aviation operations by yielding low–level cover and concealment. At the same time, these conditions restrict high–performance aircraft operations. Low–lying fog offers limited concealment from direct–view observation and weapons engagement.

3-2. GEOGRAPHICAL ENVIRONMENTS

Aviation conducts operations in all geographical environments. To effectively employ aviation forces, commanders must understand the unique characteristics of each environment and its effects on aviation operations as are described below.

a. *Mountains.*

Aviation forces are ideally suited for sustaining combat operations in mountainous terrain. In fact, the helicopter made its first real combat contributions in the mountainous terrain of Korea. Helicopters can overcome the difficulties associated with the movement and support of ground forces in mountains. Mountains provide excellent terrain-masking and radar and visual acquisition avoidance. Air movement is the principal mode for rapidly displacing forces, equipment, and supplies in mountainous areas where ground transportation is hindered from natural or man–made obstacles. The following factors affect operations in mountainous terrain:

- Terrain can limit maneuverability and engagement areas.
- In steep mountainous terrain, the look-down angle to a target can be so great that the target becomes almost impossible to engage.

- High altitudes restrict aircraft lift capabilities and armament loads.
- Weather conditions change rapidly. Snowstorms, strong winds, and turbulence occur in passes and over jagged terrain.
- Aircraft icing is common in high altitudes and may occur suddenly. Icing impedes lift in helicopters and can prevent them from flying. Most modern helicopters have de-ice/anti-ice capabilities for their rotor blades. However, these same icing conditions can still prevent attack helicopters from firing their weapons.

b. *Jungles.*

(1) Jungle operations are characterized by dense vegetation, high temperature, high humidity, and heavy rain. Army aviation significantly enhances combat operations in jungle areas. Rugged terrain, dense vegetation, and lack of roads make Army aviation's combat, combat support (CS), and combat service support (CSS) critical in conducting jungle operations. Aviation effectively provides aerial fires, reconnaissance and security, air assaults, command and control (C^2), resupply, and aeromedical evacuation.

(2) The following factors affect aviation operations in jungle terrain:

- Range and effects of weapons systems are often limited by dense jungle vegetation.
- Artillery fire can be difficult to observe and adjust.
- Thick foliage and rugged terrain reduce the range of radio communications.
- Hot, humid tropical air decreases aircraft lift capabilities.
- Weather is subject to rapid and violent change.
- Problems with corrosion are intensified, thereby increasing demands on spare parts and maintenance.

c. *Deserts.*

(1) Aviation forces can operate effectively in desert environments. Desert terrain often allows aircraft to engage targets at the maximum range of their weapons systems. However, aircraft are vulnerable to enemy long–range observation and detection because of inadequate cover and concealment.

(2) The following factors affect aviation operations in desert terrain:

- Reflected sunlight from aircraft canopies increases the possibility of enemy detection.
- High daytime temperatures decrease lift capabilities.
- Dry, sandy terrain degrades radio effectiveness.
- Windblown sand and dust cause increased maintenance and supply requirements as well as backscatter challenges for laser-designated systems.
- Featureless terrain complicates navigation.
- Telltale dust signatures and "brownout" upon landing.
- Rearm and refueling operations are complicated by blowing sand and dirt.
- Featureless desert terrain makes night vision goggle operations extremely difficult.

d. ***Arctic Areas.***

(1) Aviation combat, CS, and CSS operations should be considered normal operations in the arctic. Commanders must understand and appreciate how the polar environment affects aviation operations. In the arctic, operations maybe slowed by adverse weather or other environmental factors.

(2) Commanders operating in arctic or near-polar regions need to be aware of the following unique difficulties that aviation encounters in these regions:

- Severe arctic weather dictates major changes in operating procedures; considerations include operating in continuous darkness with low clouds, reduced visibility, whiteouts, and severe icing.
- Navigation is complicated by the scarcity of ground references.
- Arctic temperatures increase maintenance requirements.
- Aircraft capabilities may be reduced because of the additional equipment (such as skis) required to operate in arctic conditions.
- Aviation operations in snowy arctic environments may leave telltale snow signatures.
- Increased emphasis must be placed at all levels to protect the force from cold weather casualties.

e. *Urbanized Terrain.*

Urban operations present unique and complex challenges to aviation units. Urban operations can occur in any of the geographical environments. The following factors affect wiation operations in the urban environment:

- Restricted/limited landing zones (LZs) and pickup zones (PZs).
- Increased tower, antenna, and wire hazards.
- Foreign object damage to aircraft from flying debris.
- Operating in areas with high concentrations of civilians.
- Collateral damage to property.
- Night vision system operations in the vicinity of city lights.
- Degraded communications.
- High risk to aircraft from close–range, small arms fire, complicated by proximity of noncombatants.

3-3. NBC ENVIRONMENT

a. A major consideration for the force commander is the use of nuclear, biological, and chemical (NBC) weapons against friendly forces. These weapons through use, or threat of use, can cause large-scale shifts in tactical objectives, phases, and courses of action.

b. Aviation units can operate in the NBC environment. However, individual and unit performance is degraded when operations are conducted in mission-oriented protective posture (MOPP) 4. Routine tasks such as maintenance, aircraft/vehicle operation, locating and identifying targets, and night operations become infinitely more difficult when conducted in MOPP 4. The degradation caused by aviation units operating in MOPP can be significantly improved by conducting the actual operation in field training exercises while in MOPP gear. All aviation unit operations must be routinely practiced while in MOPP gear for this degradation to be overcome. It is particularly important for the pilot to be able to perform his or her combat mission while in MOPP gear.

c. The avoidance of contamination is essential for successful operations when faced with an NBC threat. Avoiding contamination allows aviation units to maintain the tactical momentum and preserves combat power by keeping soldiers out of increased NBC protective measures.

d. Force protection is an imperative in this environment. Commanders can ensure unit survivability by—

- Preparing the unit for NBC operations.
- Establishing decontamination priorities / procedures.
- Dispersing forces.
- Ensuring units use NBC contamination avoidance procedures.
- Placing units outside enemy chemical weapons range.
- Using terrain for shielding against effects of NBC weapons.
- Establishing improved positions.
- Establishing NBC protective (MOPP) requirements and procedures.
- Camouflaging and using concealment properly.
- Integrating smoke operations into the scheme of manuever.
- Ensuring NBC detectors are properly employed.
- Ensuring adequate planning has taken place to defend against a biological attack.
- Considering the level of NBC training when planning NBC aviation operations. Units deficient in NBC training should receive additional training.
- Ensuring helicopters are provided to corps units requiring heliborne C^2 and surveillance assets.

e. Because of the unique requirements and challenges of nontactical NBC hazards by aviation elements during the support of military SASO, the ability to avoid contamination can and will be extremely limited. The force commander and the aviation elements must ensure that—

- Some method and location for decontamination of aviation assets are emplaced and operational.
- The spread of contamination in noncontaminated areas by overflights and / or decontamination operations is limited.
- All procedures to limit the effect on aircrews and passengers are emplaced (i.e., sand bags on floor to reduce radiation exposure).

3-4. ELECTRONIC WARFARE ENVIRONMENT

The worldwide proliferation of electronic warfare (EW) systems—systems that can automatically locate emitters through DF (direction finding (radio)), intercept, and jam our electronic signals—makes this an important environment for commanders to be aware of and plan for. EW may be present in any operational environment ilom SASO to war. Electronic attack is especially significant to the growing number of aircrafi that rely on electronic signals for flight control. For more information on aviation operations in an EW environment, refer to FM 34-25-7 (S).